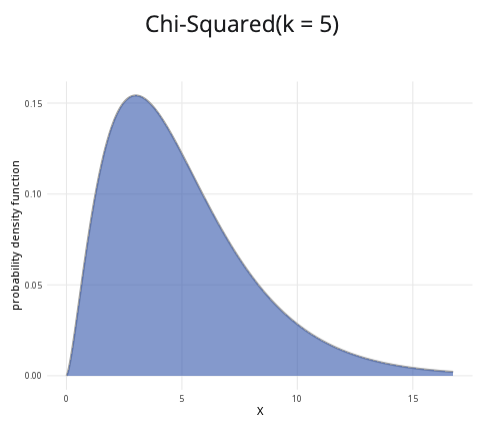
Factsheet: Chi-squared distribution

Michelle Arnetta and Tom Coleman

Summary

A factsheet for the distribution.



An example of the chi-squared distribution with .

**Where to use:** The distribution is used for hypothesis testing, such as for goodness of fit tests and tests for independence. (See [Guide: Introduction to hypothesis testing](../studyguides/hypothesistesting.qmd) for more.) It is a special case of the gamma distribution, as .

**Notation:**

**Parameter:** The integer is the number of degrees of freedom in the sample.

| Quantity | Value | Notes |
| --- | --- | --- |
| **Mean** |  |  |
| **Variance** |  |  |
| **PDF** |  | is the gamma function |
| **CDF** |  | is the gamma function, is the PDF of the gamma distribution |

**Examples:**

* **Goodness of fit example:** You have a six-sided die with six possible outcomes: and . You calculate the expected frequencies of each outcome. Then you roll the die many times and record the observed frequencies of each outcome. Since there are 6 categories,
* This can be expressed as , meaning the degrees of freedom is .
* **Test for independence example:** You are investigating whether there is a correlation between two variables: candy colour and flavour. You have categories of colours and 3 categories of flavours. Calculating the degrees of freedom can be done with the formula:
* You can model , meaning that there are degrees of freedom.

# Further reading

[This interactive element appears in Overview: Probability distributions. Please click this link to go to the guide.](../overviews/o-distributions.qmd)

## Version history

v1.0: initial version created 04/25 by tdhc and Michelle Arnetta as part of a University of St Andrews VIP project.

* v1.1: moved to factsheet form and populated with material from [Overview: Probability distributions](../overviews/o-distributions.qmd) by tdhc.

[This work is licensed under CC BY-NC-SA 4.0.](https://creativecommons.org/licenses/by-nc-sa/4.0/?ref=chooser-v1)